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2023 – 2024 Edition

INTELLIGENT TRANSPORTATION SOLUTIONS

iBASE
www.ibase.com.tw



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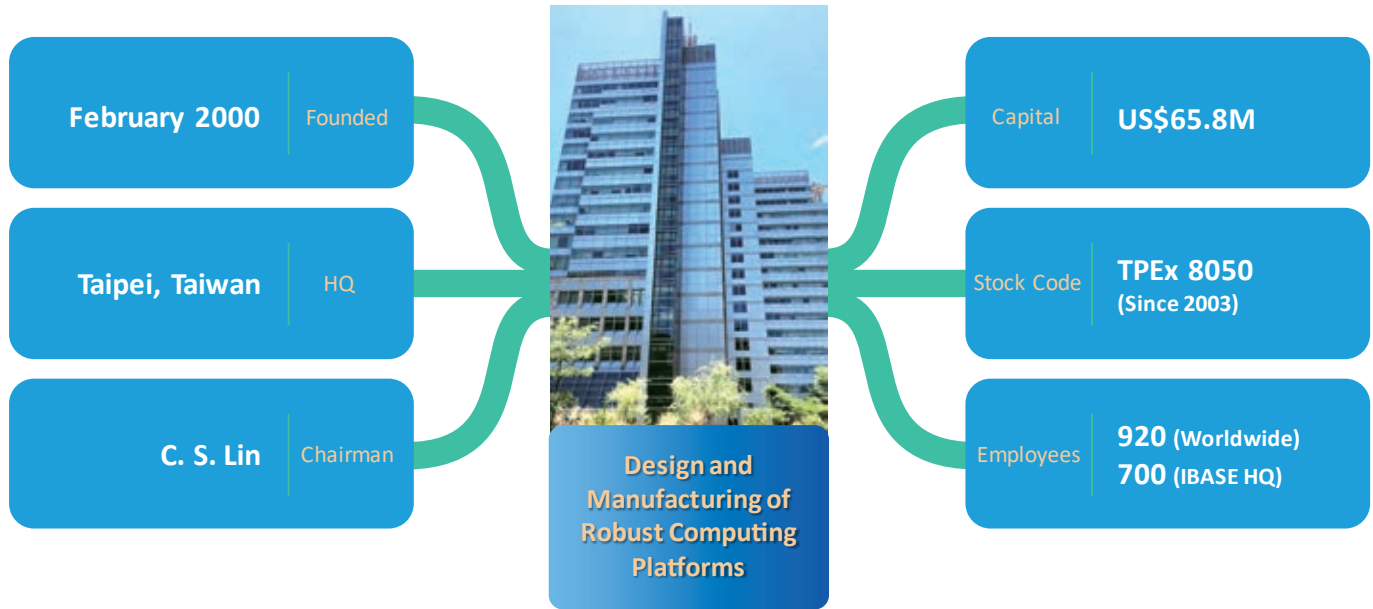
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About IBASE



Company Profile

IBASE Technology specializes in the design and manufacture of robust industrial PC, products since its establishment in 2000. IBASE carries out manufacturing and quality control at its own facilities in Taiwan that are certified with ISO 9001, ISO 13485, ISO 14001 and ISO 27001 standards. Current offerings comprise x86 and RISC-based industrial motherboards, embedded systems, panel PCs, network appliances and digital signage players. The company is publicly listed in the Taipei Exchange (TPEX: 8050) and is now a leading global provider of innovative industrial and embedded computing solutions.



Core Competence

IBASE has three manufacturing sites in Taiwan, with two in New Taipei City and another one in Taoyuan City. We manufacture and implement strict quality control to supply excellent industrial computer products that are 100% made in Taiwan. In addition to off-the-shelf products, IBASE also specializes in OEM/ODM/JDM services, tailoring products to fully meet customers' expectations and the needs of various applications. With manufacturing and quality control capabilities recognized by major international companies, IBASE boasts of strong innovative R&D teams and flexible and timely products delivery.

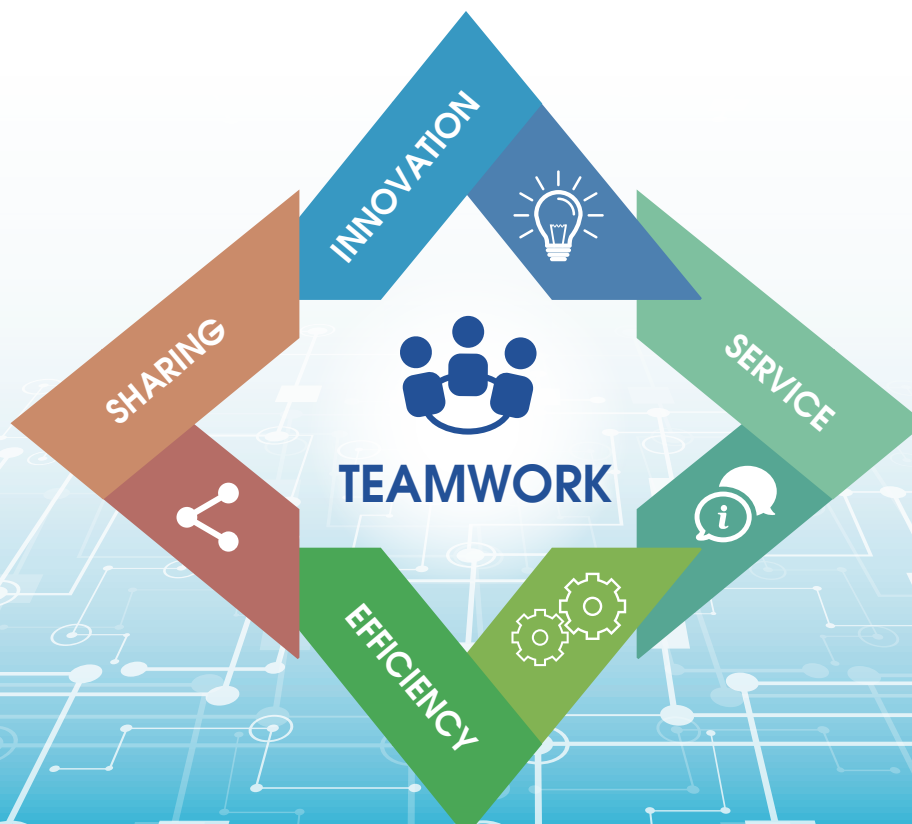


Your Best Partner

IBASE is a worldwide leader in the manufacture of reliable and multi-functional computer system and industrial panel PC products. We offer a comprehensive range of intelligent transportation PC solutions, including EN50155/EN45545 and E-mark certified computers and panel PCs design for railway and in-vehicle applications. Featuring innovative technology, such as self-debug and self-protection control systems and high-definition passenger information systems, the products meet all transportation market demands. Deployed worldwide, IBASE's secure and energy-saving intelligent transportation solutions enable safe, comfortable and efficient travel for commuters.

Aside from developing standard products, IBASE provides ODM (Original Design Manufacturer) and JDM (Joint Design Manufacturer) services and customized product solutions. With our highly-qualified expert engineers, IBASE can tailor products that meet customers' application-specific needs, ensuring high quality, reliability and longevity and provide one-stop shopping services to our valued clients.

IBASE has partnered with Intel in product development to create embedded computing solutions with unprecedented levels of performance. We have built our reputation through dedication and commitment to deliver well-designed products and an outstanding level of customer service. To this day, IBASE continue to foster an unbreakable relationship with both customers and technology vendors, working hand-in-hand to form a lasting win-win partnership.



IBASE Intelligent Transportation Solutions



Intelligent transportation solutions offer effective traffic management and mobility management through continuous monitoring of traffic conditions, traffic flow control, and timely delivery of accurate road and traffic-related information to drivers and commuters. These solutions contribute to resolving road safety issues by empowering users with better information, enabling them to make safer and smarter use of transportation networks.

IBASE is a global leader in the manufacture of reliable and multi-functional computer systems and panel PC products. Our intelligent transportation solutions are designed with robust industrial-grade electronics to ensure road safety and are well-suited for harsh environments, providing uninterrupted operation with high reliability. We offer a comprehensive range of intelligent transportation PC solutions, including EN50155:2017 and E-mark certified computers and panel PCs designed for railway and in-vehicle applications. We also have a wide range of motherboards, embedded systems, and touch panel PCs from 4" to 21.5" for deployment in various intelligent transportation applications such as traffic information management, automatic fare collection, real-time parking management, passenger information system, and driver's console HMI.

Global Deployment of Secure and Energy-Saving Intelligent Transportation Solutions

IBASE's intelligent transportation solutions are deployed worldwide, providing safe, comfortable, and efficient travel for commuters. Our secure and energy-saving solutions are designed to meet the challenges of the transportation industry, ensuring reliable performance in harsh environments. With certifications such as EN50155/EN45545 and E-mark, our products are compliant with industry standards and regulations, ensuring high quality and reliability.

Customized Solutions to Meet Application-Specific Needs

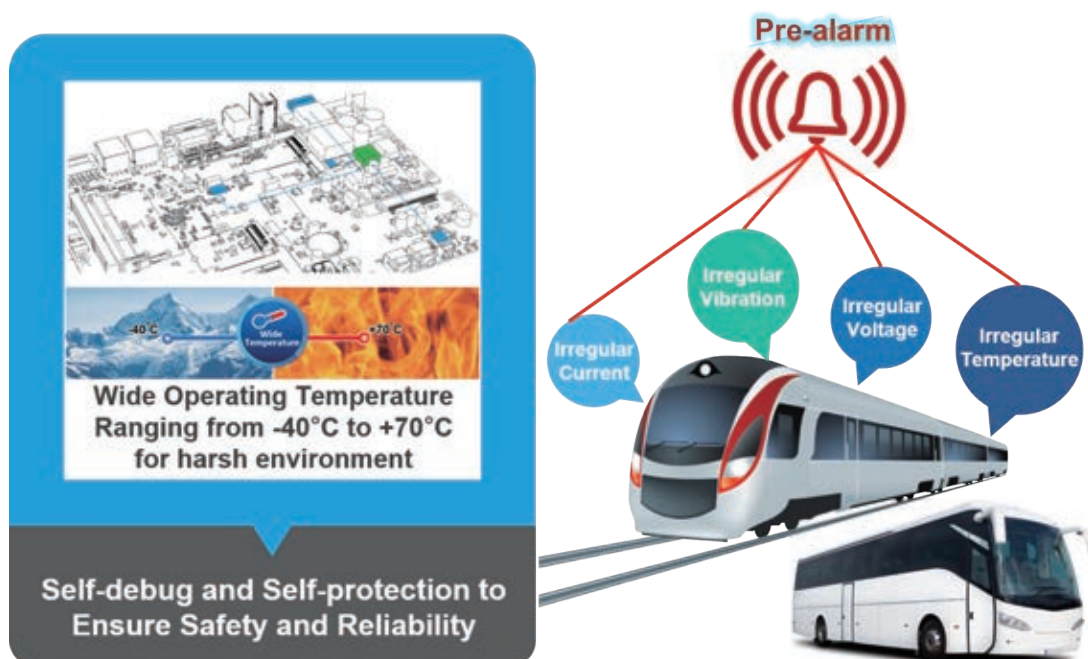
In addition to our standard products, IBASE provides ODM (Original Design Manufacturer) and JDM (Joint Design Manufacturer) services, as well as customized product solutions. With a team of highly qualified expert engineers, we can tailor products to meet the specific needs of our customers' applications, delivering high quality, reliability, and longevity. Our one-stop shopping services provide convenience and efficiency to our valued clients, allowing them to find comprehensive solutions for their transportation needs.

Strategic Partnership with Intel for Unprecedented Performance

IBASE has established a strategic partnership with Intel in product development, leveraging their cutting-edge technology to create embedded computing solutions with unprecedented levels of performance. This partnership allows us to deliver products that are at the forefront of technological advancements, ensuring our customers stay ahead in the competitive transportation market.

Commitment to Customer Service and Lasting Win-Win Partnerships

IBASE has built its reputation through dedication and commitment to delivering well-designed products and outstanding customer service. We value our relationships with both customers and technology vendors and work hand-in-hand to form lasting win-win partnerships. Our customer-centric approach ensures that we understand our customers' needs and provide timely and efficient support, establishing IBASE as a trusted partner in the intelligent transportation industry.





Features

- Intel® Atom® x6425RE/x6212RE processors
- EN50155 (2021) / EN45545-2 certified
- Fanless and ruggedized design
- Robust M12 connection for one 2.5G LAN, dual GbE LAN with PoE, dual USB
- Isolated USB, RS485 ports
- SIM socket with dual WWAN support
- Optional isolated CANbus thru Mini PCI-E card
- Wide-range operating temperature from -30°C to +70°C

Specifications

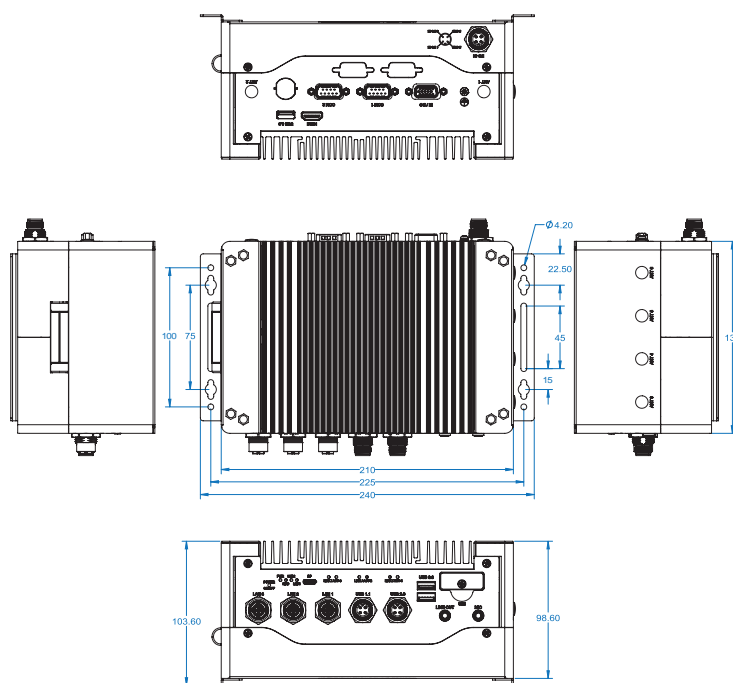
| | |
|-------------------------|--|
| System Mainboard | MBT-501R |
| CPU Type | Intel® Atom® x6212RE/ x6425RE Processor |
| Processor Speed | Intel® Atom® x6212RE: 1.2GHz Intel® Atom® x6425RE: 1.90GHz |
| Memory | 4GB/8GB LPDDR4 3200 on board |
| Front panel I/O | 1x Recessed access fact-switch for system power 4x light-pipe for four status LED 1x USB type-C with DP 6x LED with each port for network status 2x USB3.2 Gen.1 type-A 2x external accessible SIM socket 3x M12 8-pin X-code for LAN (Two GbE LAN come with PoE and one 2.5G LAN) 1x M12 4-pin A-code for USB 1.1 1x M12 4-pin A-code for USB 2.0 1x 3.5mm audio connector for line output 1x 3.5mm audio connector for MIC input |
| Rear Panel External I/O | 1x HDMI type-A 1x USB3.2 Gen.2 type-A 2x SMA antenna holes with cap 1x M3 screw hole for grounding connection 1x DSUB15 for 4x DO/4x DI and ground 1x DSUB9 for RS-232/485 1x DSUB9 for 2x RS485 isolated 1x M12 4-pin A-code for power input |
| Storage | 1x 2280 M.2 M-key (PCI-E M.2 SSD) 1x 2.5" device bay for SSD or HDD. Default 2.5" 64G SSD |
| Expansion slots | 1x mPCI-E full/half socket (PCI-E, USB 2.0) (supports SIM2) 1x 3042/52 M.2 B-key (4G/5G) (supports SIM1) |
| Power Supply | 24V DC or 72V DC/110V DC |
| Construction | Aluminum |
| Chassis Color | Black |
| Mounting | Side mounting |
| Dimensions | 240 (W) x 138 (D) x 93 (H) mm 9.4" (W) x 5.4" (D) x 3.7" (H) |
| Operating Temperature | SSD w/o PCI-E Card: -40°C ~70°C, up to 85°C for 10 minutes SSD w/ PCI-E Card: -40°C ~55°C, up to 70°C for 10 minutes HDD: -25°C ~55°C, up to 70°C for 10 minutes |
| Storage Temperature | -40°C ~ 85°C (-40°F~185°F) |
| Relative Humidity | 10 ~ 95% @ 45°C, (non-condensing) |
| Vibration | Function: 1m/S ² , 5Hz~150Hz (EN 61373) Lifetime: 7.9m/S ² , 5Hz~150Hz (EN 61373) |
| Shock | 50 m/S ² , 30 msec (EN61373) |

| | |
|-----------|---|
| Certified | EN50155: 2021 CE (EN62368/ EN55032/ EN55035)/ FCC Class-A EN45545-2 |
|-----------|---|

Ordering Information

| | |
|------------|---|
| MPT-500R | MPT-500R with MBT-501RX25, Intel® Atom® x6425RE processor, w/ 4GB RAM, 64G MLC SSD, 24V DC input |
| MPT-500RH | MPT-500RH with MBT-501RX25, Intel® Atom® x6425RE processor, w/ 4GB RAM, 64G MLC SSD, 72/110V DC input |
| MPT-500RHA | MPT-500RHA with MBT-501RX25A, Intel® Atom® x6425RE processor, w/ 8GB RAM, 64G MLC SSD, 72/110V DC input |
| MPT-500RE | MPT-500RE with MBT-501RX12, Intel® Atom® X6212RE processor, w/ 4GB RAM, 64G MLC SSD, 24V DC input |

Dimensions



MPT-1000R

Railway Computer System

EN50155/EN45545 Certified Intel® Atom® x7-E3950 Processor Railway Computer System with M12 Connection and Dual WWAN



MPT-1000R VIDEO



Specifications

| | |
|-------------------------|---|
| System Mainboard | MBT-1001R |
| CPU Type | Intel® Atom® x7-E3950 Processor |
| Processor Speed | 1.6GHz , up to 2.0GHz |
| Memory | 1x DDR3L SO-DIMM socket (horizontal type) with ECC support, default 4GB ECC |
| Front panel I/O | 1x power reset button 1x DVI-D 2x M12 X-code GbE LAN, isolated 1x USB 2.0 type-A, isolated 1x M12 A-code USB 2.0 isolated 2x Audio jack for Line-in/out 5x LED indications, one is programmable 1x SIM card slot for dual micro SIM card 1x Expansion slots reset button |
| Rear Panel External I/O | 1x 10-pin terminal block connector for - 2x insulated DO • Output type: Darlington transistor • Sink current: 500 mA for one channel @100% duty - Source current: 500 mA for one channel @100% duty cycle - Supply voltage: 5V~35V DC - Isolation voltage: 2500 VRMS - 6x insulated DI • Maximum input range: 24V, non-polarity • Digital logic levels: 0V~24V, non-polarity • Input high voltage: 5V~24V • Input low voltage: 0V~1.5V • Input resistance: 1.2k @ 0.5W Isolation voltage: 2500 VRMS - 1x DSUB9 for RS232/485, isolated - 1x DSUB9 for RS485, isolated 1x M12 4-pin D-code for 2 master CANbus, isolated 2x USB 2.0 type-A, isolated 1x M12 3-pin A-code for power input 1x Blade fuse |
| Storage | 2x 2.5" device bay for SSD/HDD 1x mSATA via miniPCI-E slot (shared with one 2.5" device) |
| Expansion slots | 1x miniPCI-E full/Half-size, supports mSATA 1x miniPCI-E full/Half-size, supports second SIM card shared with M.2 slot 1x M.2 B-key 30x42 with USB 2.0 and USB 3.0 signal only, supports 2x SIM cards |
| Power Supply | 9V~32VDC, 1.5KV galvanic isolation protection |
| Construction | Matel |
| Chassis Color | Black |
| Mounting | Side mounting, rack mounting with optional bracket |
| Dimensions | 340 (W) x 183.4 (D) x 67.6 (H) mm 13.3" (W) x 7.22" (D) x 2.66" (H) |

Features

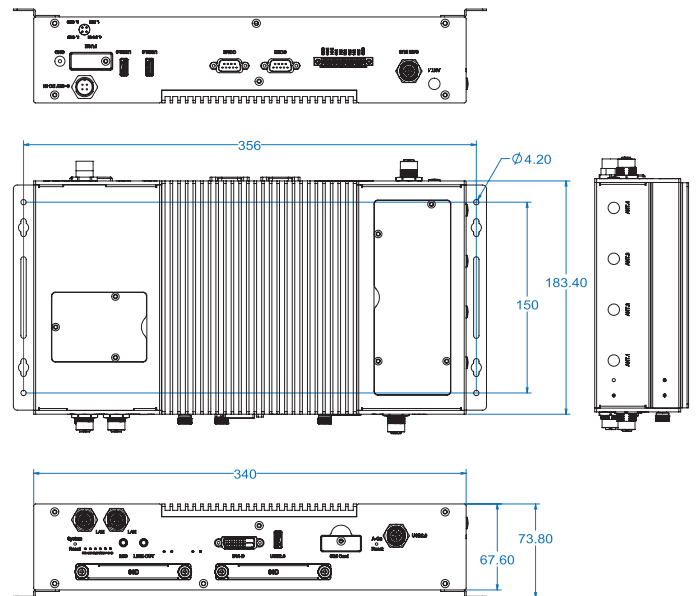
- EN50155 (2017) certified
- Fanless and ruggedized design
- Robust M12 connection for dual GbE, USB
- Onboard isolated CANbus
- SIM socket supports Dual WWAN
- Add on card slots reset function
- Quick accessible RTC battery

| | |
|-----------------------|--|
| Operating Temperature | -40°C ~70°C, with SSD, not including add-on cards |
| Storage Temperature | -40°C ~ 85°C (-40°F~185°F) |
| Relative Humidity | 10 ~ 95% @ 45°C, (non-condensing) |
| Vibration | Function: 1m/S2, 5Hz~150Hz (EN 61373) Lifetime: 7.9m/S2, 5Hz~150Hz (EN 61373) |
| Shock | 50 m/S2, 30 msec (EN61373) |
| Certified | EN50155: 2017 CE (EN62368/ EN55032/ EN55025)/ FCC Class-A EN45545-2 |

Ordering Information

| | |
|------------|---|
| MPT-1000RM | MPT-1000R with MBT-1001R, Intel® Atom® x7-E3950 Processor, 4G DDR3L ECC RAM, 2x M12 GbE LAN, 24VDC(-25%~+30%), No OS, adaptor and storage |
|------------|---|

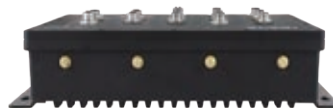
Dimensions





Features

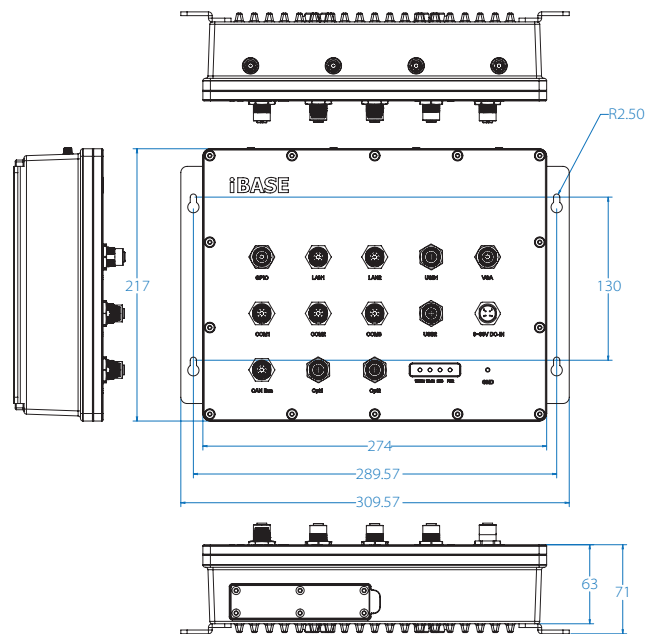
- EN50155 (2017) certified and IP67 rated
- Fanless and ruggedized design
- Robust M12 connectors for dual GbE, USB and power input
- Dual SIM sockets support WWAN redundancy
- Rich I/O interfaces for wireless, SSD, GPS, WWAN
- Ignition power control
- Wide-range voltage GPIO interface



Ordering Information

| | |
|------------|---|
| MPT-3000RP | Intel® Atom® Processor E3845, 128G M.2 SSD, 4G DDR3LRAM, 9V~36VDC, totally IP67, No adaptor |
|------------|---|

Dimensions



Specifications

| | |
|-------------------------|--|
| System Mainboard | MBT-3001R |
| CPU Type | Intel® Atom® Processor E3845 |
| Processor Speed | 1.91GHz |
| Memory | 2x 2GB DDR3L-1333 SO-DIMM (Dual Channel) |
| Front panel I/O | CFAST, 2.5" drive bay, 2x SIM sockets 2x M12 USB 2.0 4x antenna connectors 1x M12 VGA, 3x M12 COMs, 2x M12 GbE, 1x M12 power connection 1x M12 GPIO, 1x M12 CAN Bus Status LEDs |
| Rear Panel External I/O | N/A |
| Storage | 2.5" drive bay for SSD & HDD M.2 SSD Storage |
| Expansion slots | 1x Half-size Mini PCI-E socket (USB 2.0) 1x Full-size Mini PCI-E socket (USB 2.0 + PCI-E) 1x 2230 M.2 E-Key socket (USB 2.0 + PCI-E) 1x 3042 M.2 B-Key WWAN socket (USB 2.0) 1x 2280 M.2 M-Key SSD socket (SATA) |
| Power Supply | DC 9V~36V / 72V / 110V |
| Construction | Aluminum |
| Chassis Color | Black |
| Mounting | Wall Mount |
| Dimensions | 270.0 (W) x 63.0 (D) x 210.0 (H) mm 10.62" (W) x 2.48" (D) x 8.26" (H) |
| Operating Temperature | SSD: -40°C ~ 70°C (-40°F~158°F) |
| Storage Temperature | -40°C ~ 85°C (-40°F~185°F) |
| Relative Humidity | 10 ~ 95% RH @ 45°C (non-condensing) |
| Vibration | Function: 1 m/s ² , 5Hz ~ 150 Hz (EN 61373) Lifetime: 5.72 m/s ² , 5Hz ~ 150 Hz (EN 61373) |
| Shock | 50 m/s ² , 30 msec (EN 61373) |
| Certified | EN50155: 2017, EN50153:2014 EN50121-3-2:2015, CE Class-A, FCC Class-A, EN45545 |



Features

- EN50155 (2021) certified
- Fanless and ruggedized design
- Robust M12 connection for dual GbE, USB and power input
- Dual SIM sockets support WWAN redundancy
- Removable 2.5" device bay and CFast socket
- Rich I/O interfaces for wireless, SSD, GPS, WWAN and add-on card expansion
- Ignition power control
- Wide-range voltage GPIO interface

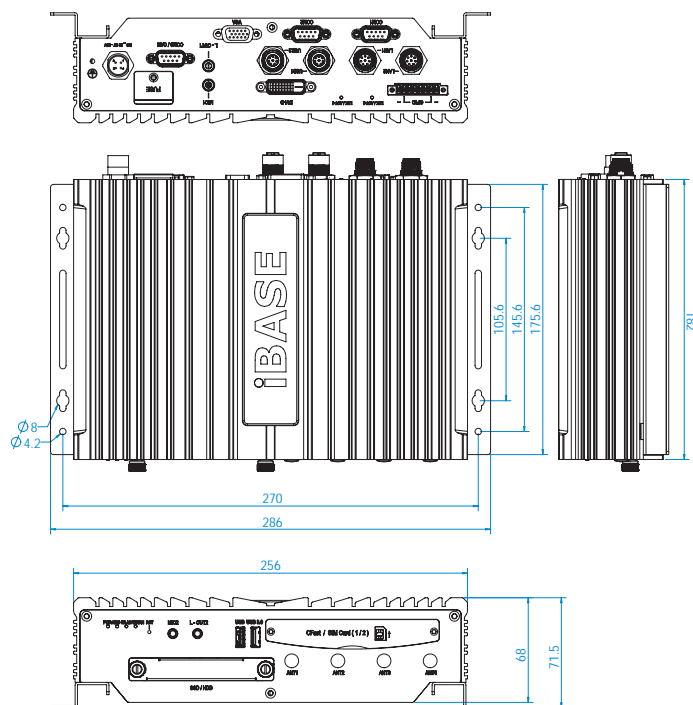
Specifications

| | |
|--------------------------|--|
| System Mainboard | MBT-3001R |
| CPU Type | Intel® Atom® Processor E3845 |
| Processor Speed | 1.91GHz |
| Memory | 2x 2GB DDR3L-1333 SO-DIMM (Dual Channel) |
| Front Panel External I/O | CFast, 2.5" device bay, 2nd Mic-In & Line-Out 2x SIM sockets, 1x USB 3.0, 1x USB 2.0, Reset button Status LEDs, 4x antenna connectors |
| Rear Panel External I/O | DVI-D, VGA, 3x COMs (one with RS422/485 options) 2x M12 GbE, 2x M12 USB 2.0, M12 power connection 1st Mic-In & Line-Out, GPIO, GbE status LEDs |
| Storage | 2.5" device bay for SSD & HDD |
| Expansion slots | 1x Half-size Mini PCI-E socket (USB 2.0) 1x Full-size Mini PCI-E socket (USB 2.0 + PCI-E) 1x 2230 M.2 E-Key socket (USB 2.0 + PCI-E) 1x 3042 M.2 B-Key WWAN socket (USB 2.0) 1x 2280 M.2 M-Key SSD socket (SATA) |
| Power Supply | DC 9V~36V / 72V / 110V |
| Construction | Aluminum |
| Chassis Color | Black |
| Mounting | Custom mounting rail |
| Dimensions | 256.0 (W) x 182.0 (D) x 68.0 (H) mm 10.08" (W) x 7.17" (D) x 2.68" (H) |
| Operating Temperature | SSD: -40°C ~ 70°C (-40°F~158°F) HDD: -20°C ~ 50°C (-4°F~122°F) |
| Storage Temperature | -40°C ~ 85°C (-40°F~185°F) |
| Relative Humidity | 10 ~ 95% RH @ 45°C (non-condensing) |
| Vibration | Function: 1 m/s ² , 5Hz~150 Hz (EN 61373) Lifetime: 5.72 m/s ² , 5Hz~150 Hz (EN 61373) |
| Shock | 50 m/s ² , 30 msec (EN 61373) |
| Certified | EN50155:2021, EN50153:2014 EN50121-3-2:2015, CE Class-A, FCC Class-A, EN45545 |

Ordering Information

| | |
|------------------|---|
| MPT-3000RSM | MPT-3000R with MBT-3001R, Intel® Atom® Processor E3845 w/ 2x 2GB DDR3L-1333, SSD bay, No PSU, No storage (RoHS) |
| MPT-3000RHVSM | MPT-3000R with MBT-3001R, Intel® Atom® Processor E3845 w/ 2x 2GB DDR3L-1333, SSD bay, No PSU, No storage (RoHS) 72V/110V DC |
| M12-PWR-Cable-1 | 120cm M12 power cable for MPT series / Lead Only |
| M12-USB-Cable-1 | 300cm M12 to one USB receptacle cable for MPT series |
| M12-RJ45-Cable-1 | 300cm M12 to one RJ45 jack cable |
| Fuse-HV | Fuse for HV version |

Dimensions





Features

- Fanless and ruggedized design
- Robust M12 connectors for dual GbE, USB and power input
- Dual SIM sockets support WWAN redundancy
- Onboard isolated CAN 2.0A / 2.0B / CAN-FD
- Removable 2.5" device bay for SSD storage
- Rich I/O interfaces for wireless, SSD, GPS, WWAN and add-on card expansion
- Ignition power control
- Wide-range voltage GPIO interface
- 1x USB Type-C with graphics output for quick setting and diagnostics

Specifications

| | |
|--------------------------|---|
| System Mainboard | MBT-3101R |
| CPU Type | Intel® Atom® x6425RE Processor |
| Processor Speed | Up to 1.9GHz |
| Memory | 2x 4GB DDR4-3200 SO-DIMM (Dual Channel) |
| Front Panel External I/O | 2x USB3.2 Gen2 stack Type-A connector 1x DisplayPort with lockable hole design 2x External accessible SIM socket 2x Removable 2.5" SSD device bay 1x 3.5mm Line-out / MIC-in 1x Reset button 1x 8-pin terminal block for digital I/O with 24V input and output 6x SMA antenna holes 4x Light-pipe for status LED indicators |
| Rear Panel External I/O | 2x M12 X-code 8P female for GbE LAN1/LAN2 1x M12 A-code 4P male for DC-input 1x DVI-D connector, 1 x VGA connector 1x USB Type-C connector with DP 1x 4-pin terminal block for 2 x CAN bus master 1x DB9M for COM#1 / COM#2 1x Removable blade fuse holder 2x Light-pipe for LAN status LED indicators |
| Storage | 1x M.2 2280 M-Key socket for NVMe SSD (PCI-E x4 [Gen.4]) 1x 2.5" removable device bay for SSD |
| Expansion slots | 1x M.2 2230 E-Key socket for WLAN & BT connection (PCI-E + USB2.0 + SMBus). 1x M.2 3042/52 B-Key socket for WWAN (4G/5G) connection (PCI-E + USB3.2 + SMBus). 1x M.2 2280 M-Key socket for NVMe SSD / Hailo AI module (PCI-E x4 [Gen.4]) 1x Mini PCI-E full-size socket for MVB/CAN FD module (PCI-E + USB2.0 + SMBus) |
| Power Supply | DC-input for 24V/72V/110V |
| Construction | Aluminum |
| Chassis Color | Black |
| Mounting | Wall mount |
| Dimensions | 256.0 (W) x 182.0 (D) x 83.0 (H) mm 10.08" (W) x 7.17" (D) x 3.27" (H) |
| Operating Temperature | -40°C ~70°C (-40°F~158°F) (w/o FAN & SSD), up to 85°C for 10 minutes according to EN 50155 OT4 -20°C ~55°C (-4°F~131°F) (w/ PCI-E card) |
| Storage Temperature | -40°C ~ 85°C (-40°F~185°F) |
| Relative Humidity | 10 ~ 95% RH @45°C (non-condensing) |

| | |
|-----------|---|
| Vibration | Function: 1 m/s ² , 5Hz~150 Hz (EN 61373) Lifetime: 7.9 m/s ² , 5Hz~150 Hz (EN 61373) |
| Shock | 50 m/s ² , 30 msec (EN 61373) |
| Certified | EN 50155:2021, EN 45545 -2 HL1/2/3 2020 CE (EN 62368-1 / EN55032 / EN55035), FCC Class A UKCA (BS EN 62368-1 / BS EN55032 / BS EN55035) |

Ordering Information

| | |
|------------|---|
| MPT-3100R | MPT-3100R with MBT-3101R, Intel® Atom® x6425RE Processor w/ 2x 4GB DDR4-3200, 1x SSD bay, No PSU, No storage (RoHS) 24V DC-in |
| MPT-3100RH | MPT-3100R with MBT-3101R, Intel® Atom® x6425RE Processor w/ 2x 4GB DDR4-3200, 1x SSD bay, No PSU, No storage (RoHS) 72/110V DC-in |

MPT-7000R

Railway Computer System

EN50155/EN45545 Certified 7th/6th Gen Intel® Core™ Processor
 Railway Computer System with M12 Connection and WWAN Redundancy



Specifications

| | |
|--------------------------|--|
| System Mainboard | MBT-7001R |
| CPU Type | 7th/6th Gen Intel® Core Processor |
| Processor Speed | 2.6GHz |
| Memory | 2x 4GB DDR4-2133 SO-DIMM (Dual Channel) |
| Front Panel External I/O | CFlash, 2.5" device bay, 2nd Mic-In & Line-Out 2x SIM sockets, 2x USB 3.0, Reset button Status LEDs, 4x antenna connectors |
| Rear Panel External I/O | DVI-D, VGA, 3x COMs (2x COMs for HV model, one with RS422/485 options), 2x M12 GbE, 2x M12 USB 2.0, M12 power connection, 1st Mic-In & Line-Out, GPIO, GbE status LEDs, 1x PCI-E (x4) slot |
| Storage | 2x 2.5" device bay for SSD & HDD |
| Expansion slots | 1x Half-size Mini PCI-E socket (USB 2.0) 1x Full-size Mini PCI-E socket (USB 2.0 + PCI-E) 1x 2230 M.2 E-Key socket (USB 2.0 + PCI-E) 1x 3042 M.2 B-Key WWAN socket (USB 2.0) 1x 2280 M.2 M-Key SSD socket (SATA) |
| Power Supply | DC 9V~36V / 72V / 110V |
| Construction | Aluminum |
| Chassis Color | Black |
| Mounting | Custom mounting rail |
| Dimensions | 256.0 (W) x 182.0 (D) x 83.0 (H) mm 10.08" (W) x 7.17" (D) x 3.27" (H) |
| Operating Temperature | SSD: -30°C ~ 55°C (-22°F~131°F) HDD: -20°C ~ 45°C (-4°F~113°F) SSD: -40°C ~ 70°C (-40F ~ 158F) system only |
| Storage Temperature | -35°C ~ 85°C (-31°F~185°F) |
| Relative Humidity | 10 ~ 95% RH @45°C (non-condensing) |
| Vibration | Function: 1 m/s ² , 5Hz~150 Hz (EN 61373) Lifetime: 5.72 m/s ² , 5Hz~150 Hz (EN 61373) |
| Shock | 50 m/s ² , 30 msec (EN 61373) |
| Certified | EN50155:2021, EN50153:2014 EN50121-3-2:2015, CE Class-A, FCC Class-A, EN45545 |

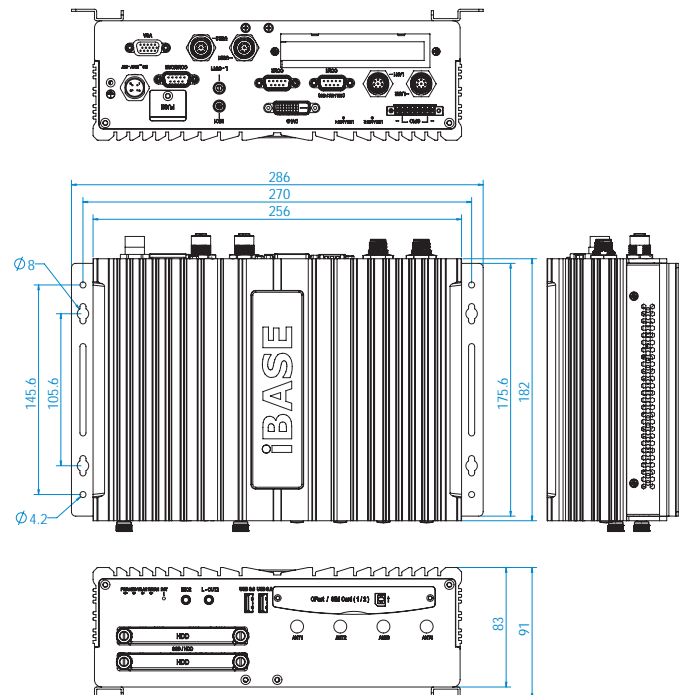
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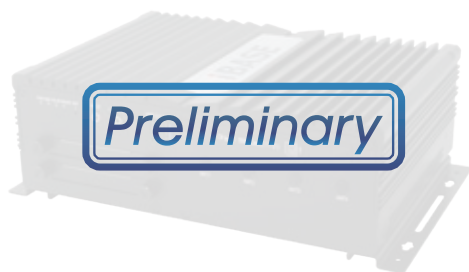
- EN50155 (2021) certified
- Fanless and ruggedized design
- Robust M12 connectors for dual GbE, USB and power input
- Dual SIM sockets support WWAN redundancy
- Two removable 2.5" device bay and CFlash socket
- Rich I/O interfaces for wireless, SSD, GPS, WWAN and add-on card expansion
- Ignition power control
- Wide-range voltage GPIO interface
- One PCI-E (x4) expansion

Ordering Information

| | |
|------------------|--|
| MPT-7000RSM | MPT-7000R with MBT-7001R, 6th Gen Intel® Core™ i7-6600U Processor w/ 2x 4GB DDR4-2133, 2x SSD bay, No PSU, No storage (RoHS) 24V DC |
| MPT-7000RHVSM | MPT-7000R with MBT-7001R, 6th Gen Intel® Core™ i7-6600U Processor w/ 2x 4GB DDR4-2133, 2x SSD bay, No PSU, No storage (RoHS) 72V/110V DC |
| M12-PWR-Cable-1 | 120cm M12 power cable For MPT Series / Lead Only |
| M12-USB-Cable-1 | 300cm M12 to one USB receptacle cable for MPT series |
| M12-RJ45-Cable-1 | 300cm M12 to one RJ45 jack cable |
| Fuse-HV | Fuse for HV version |

Dimensions





Features

- Fanless and ruggedized design
- Robust M12 connectors for dual GbE, USB and power input
- Dual SIM sockets support WWAN redundancy
- Onboard isolated CAN 2.0A / 2.0B / CAN-FD
- Two removable 2.5" device bay for SSD storage
- Rich I/O interfaces for wireless, SSD, GPS, WWAN and add-on card expansion
- Ignition power control
- Wide-range voltage GPIO interface
- 1x USB Type-C with graphics output for quick setting and diagnostics

Specifications

| | |
|--------------------------|---|
| System Mainboard | MBT-7100R |
| CPU Type | 13th Gen Intel® Core U-Series Processor |
| Processor Speed | Up to 3.0GHz |
| Memory | 2x 8GB DDR5-4800 SO-DIMM (Dual Channel) |
| Front Panel External I/O | 2x USB3.2 Gen2 stack Type-A connector 2x External accessible SIM socket 1x USB Type-C connector with DP 2x Removable 2.5" SSD device bay 1x 3.5mm green color audio for Line-out 1x 3.5mm pink color audio for MIC-in 1x Reset button 1x 10-pin terminal block for digital I/O 8x SMA antenna holes 6x Light-pipe for status LED indicators (2x programmable) |
| Rear Panel External I/O | 2x M12 X-code 8P female for GbE LAN1/LAN2 1x M12 A-code 4P male for DC-input 2x M12 D-code 4P female for USB 2.0 1x DisplayPort with lockable hole design 1x DVI-D connector, 1x VGA connector 1x 6-pin terminal block for 2 x CAN bus master 2x DB9M for COM#1 / COM#2 1x Removable blade fuse holder 4x Light-pipe for LAN status LED indicators 1x M3 with washer screw hole for grounding connection |
| Storage | 1x M.2 2280 M-Key socket for NVMe SSD (PCI-E x4 [Gen.4]) 2x 2.5" removable device bay for SSD |
| Expansion slots | 1x M.2 2230 E-Key socket for WLAN & BT connection (PCI-E + USB2.0 + SMBus). 1x M.2 3042/52 B-Key socket for WWAN (4G/5G) connection (PCI-E + USB3.2 + SMBus). 1x M.2 2280 M-Key socket for NVMe SSD / Hailo AI module (PCI-E x4 [Gen.4]) 1x Mini PCI-E full-size socket for MVB/CAN FD module 1x Mini PCI-E half-size socket (USB 2.0) (PCI-E + USB2.0 + SMBus) |
| Power Supply | DC-input for 24V/72V/110V |
| Construction | Aluminum |
| Chassis Color | Black |
| Mounting | Wall mount |
| Dimensions | 256.0 (W) x 182.0 (D) x 83.0 (H) mm 10.08" (W) x 7.17" (D) x 3.27" (H) |
| Operating Temperature | -40°C ~ 70°C (-40°F ~ 158°F) (w/o FAN & SSD), up to 85°C for 10 minutes according to EN 50155 OT4 -20°C ~ 55°C (-4°F ~ 131°F) (w/ PCI-E card) |

| | |
|---------------------|---|
| Storage Temperature | -40°C ~ 85°C (-40°F ~ 185°F) |
| Relative Humidity | 10 ~ 95% RH @45°C (non-condensing) |
| Vibration | Function: 1 m/s ² , 5Hz~150 Hz (EN 61373) Lifetime: 7.9 m/s ² , 5Hz~150 Hz (EN 61373) |
| Shock | 50 m/s ² , 30 msec (EN 61373) |
| Certified | EN 50155:2021, EN 45545 -2 HL1/2/3 2020 CE (EN 62368-1 / EN55032 / EN55035), FCC Class A UKCA (BS EN 62368-1 / BS EN55032 / BS EN55035) |

Ordering Information

| | |
|------------|---|
| MPT-7100R | MPT-7100R with MBT-7101R, 13th Gen Intel® Core™ i7-1365URE Processor w/ 2x 8GB DDR5-4800, 2x SSD bay, No PSU, No storage (RoHS) 24V DC-in |
| MPT-7100RH | MPT-7100R with MBT-7101R, 13th Gen Intel® Core™ i7-1365URE Processor w/ 2x 8GB DDR5-4800, 2x SSD bay, No PSU, No storage (RoHS) 72/110V DC-in |

MPT-8000R

Railway Computer System

EN50155/EN45545 Certified 10th Gen Intel® Core™ Processor
Railway Computer System with M12 Connection and Dual WWAN



Features

- EN50155 (2021) / EN45545-2 certified
- AI solution for Transportation application
- Supports 10th Gen Intel® Core™ Desktop processors
- Up to 10x GbE ports (8x with PoE capability)
- Optional 10G LAN
- Supports Intel® Movidus Vision Acceleration M.2 modules
- Supports Wi-Fi 6 CNVi, dual WWAN channels, RAID 0/1/5
- 1x USB Type-C with graphics output for quick setting and diagnostics

Specifications

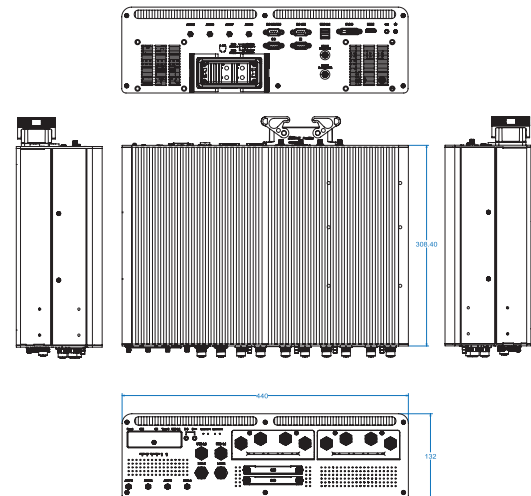
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|--------------------------|--|
| System Mainboard | MBT-8001RW |
| CPU Type | 10th Gen Intel® Core™ Desktop processors |
| Processor Speed | 4.5GHz |
| Memory | 2x DDR4-2666 SO-DIMM, 2x 8GB (default) Maximum size supported: 128GB |
| Front Panel External I/O | 2x Accessible 2.5" device bay (SSD/HDD) 2x M12 X-code 8-pin for GbE LAN, isolated 1x M12 4-pin A-code for USB 2.0, isolated 1x M12 4-pin A-code for USB 1.1, isolated 1x 3.5mm pink audio connector for MIC-Input 1x 3.5mm blue audio connector for Line in 4x SMA Antenna holes with cap 2x PCI-Ex4 card slots for IDT8102/IDT 7204 (with cover when empty) - IDT8102: 2x 10G LAN card - IDT7204: 4x 1G PoE card 2x External accessible SIM socket 1x Micro SD card socket 1x Recessed Access Tach-switch for System Reset 1x USB type-C with graphics (No PD function) 1x USB3.2 Gen.2 type-A Indicators: Four light-pipe for four status LED - 1x 0402 SMT green LED for power status - 1x 0402 SMT white LED for storage activity status - 1x 0402 SMT blue LED for WLAN activity status - 1x 0402 SMT amber LED for WWAN activity - 2x 0402 SMT green LED, programmable |
| Rear Panel External I/O | 1x Main power input, Staubli connector 2x Removable with screw lock FUSE holder 1x Backup power source, 24VDC only 1x DVI-D output 1x HDMI output 1x USB3.2 Gen.1 type-A 1x 3.5mm green audio connector for Line-out 1x Male DSUB9 for RS-485, isolated 1x Male DSUB9 connector for RS-232/485, isolated 1x Female DSUB9 for 8x DO and ground by cable, isolated 1x Female DSUB9 for 8x DI and ground by cable, isolated 1x M4 with washer screw hole for grounding connection 4x SMA Antenna holes with cap |
| Storage | 2x 2.5" Removable device bay for SSD devices 2x M.2 M-key SSD devices RAID 0/1/5 supported, Max. 4x SATA devices |
| Expansion slots | 1x mPCI-E full/half-size socket 1x 3042/52 M.2 B-Key socket for WWAN (supports SIM1) - This M.2 socket comes with USB2.0/3.0/PCI-Ex1 interface only 1x 3042/52 M.2 B-Key socket for WWAN (supports SIM2) - This M.2 socket comes with USB2.0/PCI-Ex1 interface 1x 2242/80 M.2 M-key socket for SSD/VPD/WLAN card 1x 2242/80 M.2 M-key socket for SSD/VPD/WLAN card (NVMe support) 1x 2230 M.2 E-Key socket for WLAN (CNVi support) |

| | |
|-----------------------|--|
| Power Supply | Main: 72V/110VDC Second: 24V DC only, once the main power loses, switch to second power automatically |
| Construction | Metal |
| Chassis Color | Black |
| Mounting | 19" Rack mount |
| Dimensions | 482 (W) x 308 (D) x 132 (H) mm 18.97" (W) x 12.13" (D) x 5.2" (H) |
| Operating Temperature | -10°C ~ 60°C (14°F ~ 140°F) |
| Storage Temperature | -40°C ~ 85°C (-40°F ~ 185°F) |
| Relative Humidity | 10 ~ 95% @ 45°C, (non-condensing) |
| Vibration | EN61373 |
| Shock | EN61373 |
| Certified | EN50155: 2021, EN45545-2 CE/FCC class-A |

Ordering Information

| | |
|------------|---|
| MPT-8000RH | MPT-8000R with MBT-8001R, 10th Gen Intel® Core Xeon W-1250TE with W480E PCH, w/ 2x 8GB DDR4-2666, 2x SSD bay, No PSU, No storage (RoHS2) 72/110V DC-input |
|------------|---|

Dimensions





MPT-1000V VIDEO



Features

- SIM socket supports Dual WWAN
- Removable 2.5" device bay
- Ignition power-on signal control
- Onboard CANbus
- Rich I/O interfaces for wireless, SSD, GPS, WWAN and add-on card expansion
- Add on card slots reset function
- Quick accessible RTC battery

Specifications

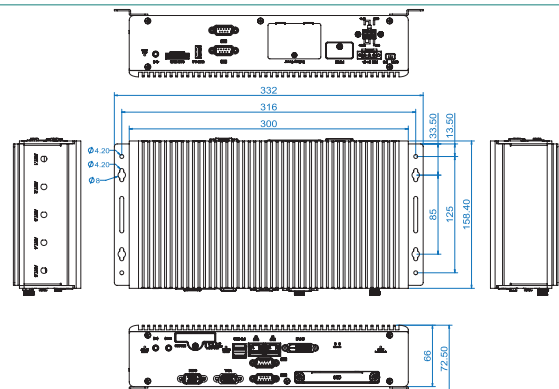
| | |
|-------------------------|--|
| System Mainboard | MBT-1002V |
| CPU Type | Intel® Atom® x7-E3950 Processor Intel® Celeron® N3350 Processor |
| Processor Speed | 1.6GHz , up to 2.0GHz |
| Memory | Onboard 4GB LPDDR4 memory (Intel® N3350 SKU) Onboard 8GB LPDDR4 memory (Intel® E3950 SKU) |
| Front panel I/O | <p>1x DVI-D connector for display connection 1x VGA DSUB15 2x RJ45 for GbE LAN 1x 3.5mm blue color audio connector for line input 1x 3.5mm pink color audio connector for MIC-Input 2x external accessible SIM socket (Coved) 1x external micro SD card slot (Coved together with SIM card holder) 1x Stack USB connector for 2x USB3.1 (#1/#2) 1x DUSB 9 for COM1 RS-232/485 1x DUB9 for COM2 RS-485 isolated 1x DSUB15 for DIDO 6in/6out isolated</p> <p>6x insulated DO:</p> <ul style="list-style-type: none"> - Output type: Darlington transistor - Sink current •500 mA for one channel @100% duty - Source current •500 mA for one channel @100% duty cycle - Supply voltage: 5V-35V DC - Isolation voltage: 2500V RMS <p>6x insulated DI:</p> <ul style="list-style-type: none"> - Maximum input range •24V, non-polarity - Digital logic levels •0~24 V, non-polarity - Input high voltage: 5V~24V - Input low voltage: 0~1.5V - Input resistance: 1.2 k @ 0.5W - Isolation voltage •2500V RMS <p>1x tack switch for system reset 1x tack switch for Add-on cards reset 1x tack switch for power firmware load default</p> <p>Indicators:</p> <ul style="list-style-type: none"> - 1x Green color LED for power status - 1x White color LED for storage activity status - 1x Blue color LED for WLAN activity status (option) - 1x Orange color LED for WWAN activity status (option) - 1x Green color LED, programmable - 1x Red color LED for warning of wrong power voltage connected - 1x Blue color LED for external battery connected |
| Rear Panel External I/O | <p>2x DSUB9 for COM3/4 RS232 1x 4 pins terminal block for 2 masters CANbus 1x USB3.0 flag type-A 1x Audio jack for line out 1x Tack switch for clear CMOS 1x Open window for accessing RTC battery 1x 6-pins ATX connector for external battery, and 19V DC(Max:1A) output 1x Blade fuse socket with cover 1x DIP switch for selecting power mode: CAR/DC 1x 3-pin terminal block connector for power input and IGN</p> |
| Storage | 1x 2.5" device bay for SSD/HDD 1x mSATA via miniPCI-E slot |

| | |
|-----------------------|--|
| Expansion slots | 1x miniPCI-E full/Half-size, supports mSATA 1x miniPCI-E full/Half-size, supports second SIM card 1x M.2 B-key 30x42 with USB 2.0 and USB 3.0 signal only, supports first SIM card |
| Power Supply | 9V~32V DC input(10%) without backup battery power 12V~32V DC input with backup battery Ignition detection: enable (Car mode)/ disable (DC mode) Reverse protection |
| Construction | Matel |
| Chassis Color | Black |
| Mounting | Side mounting, rack mounting with optional bracket |
| Dimensions | 300 (W) x 158.4 (D) x 66 (H) mm 11.8" (W) x 6.23" (D) x 2.6" (H) |
| Operating Temperature | -40°C~70°C, with SSD, not including add-on cards (Intel® E3950 SKU) -5°C~50°C, with SSD, not including add-on cards (Intel® N3350 SKU) |
| Storage Temperature | -40°C~85°C (-40°F~185°F) |
| Relative Humidity | 10 ~ 95% @ 45°C, (non-condensing) |
| Vibration | Operating/Non-operating: 2,26 Grms (5~500 Hz) / MIL-STD-810G composite wheeled condition (Z-axis only) |
| Shock | Non-operating: Sawtooth: 40G, 11 msec (Z-axis) Operating: Sawtooth: 20G, 11 msec (Z-axis) |
| Certified | E-Mark, CE (EN 62368 / EN55032 / EN55025)/ FCC Class-A |

Ordering Information

| | |
|--------------|---|
| MPT-1000V8GM | Intel® E3950 processor, 8G LPDDR4 RAM onboard, 9V~32V DC input (12V~32VDC if connected with backup power), ignition detection, no OS, adaptor and storage |
| MPT-1000VNM | Intel® N3350 processor, 4G LPDDR4 RAM onboard, 9V~32V DC input (12V~32VDC if connected with backup power), ignition detection, no OS, adaptor and storage |

Dimensions





Specifications

| | |
|--------------------------|--|
| System Mainboard | MBT-3001V |
| CPU Type | Intel® Atom® Processor E3845 |
| Processor Speed | 1.91GHz |
| Memory | 2x 2GB DDR3L-1333 SO-DIMM (Dual Channel) |
| Front Panel External I/O | CFAST, 2.5" device bay, 2nd Mic-In & Line-Out 2x SIM sockets, 1x USB 3.0, 1x USB 2.0, Reset button, Status LEDs, 4x antenna connectors |
| Rear Panel External I/O | DVI-D, VGA, 3x COMs (one with RS422/485 options) 2x GbE, 2x USB 2.0, power connection 1st Mic-In & Line-Out, GPIO, GbE status LEDs |
| Storage | 2.5" device bay for SSD & HDD |
| Expansion slots | 1x Half-size Mini PCI-E socket (USB 2.0) 1x Full-size Mini PCI-E socket (USB 2.0 + PCI-E) 1x 2230 M.2 E-Key socket (USB 2.0 + PCI-E) 1x 3042 M.2 B-Key WWAN socket (USB 2.0) 1x 2280 M.2 M-Key SSD socket (SATA) |
| Power Supply | DC 9V~36V |
| Construction | Aluminum |
| Chassis Color | Black |
| Mounting | Custom mounting rail |
| Dimensions | 256.0 (W) x 182.0 (D) x 55.0 (H) mm 10.08" (W) x 7.17" (D) x 2.16" (H) |
| Operating Temperature | SSD: -40°C ~ 70°C (-40°F~158°F) HDD: -20°C ~ 50°C (-4°F~122°F) |
| Storage Temperature | -40°C ~ 85°C (-40°F~185°F) |
| Relative Humidity | -40°C ~ 85°C (-40°F~185°F) |
| Vibration | Operating/Non-operating (SSD): 2.26 Grms (5~500 Hz) / MIL-STD-810G composite wheeled condition (Z-axis only) Operating/Non-operating (HDD): 1.04 Grms (5~500 Hz) / MIL-STD-810G highway truck condition (Z-axis only) |
| Shock | Non-operating: Sawtooth: 40G, 11 msec (Z-axis) Operating: Sawtooth: 20G, 11msec (Z-axis) |
| Certified | E-mark, CE class B, FCC class B |

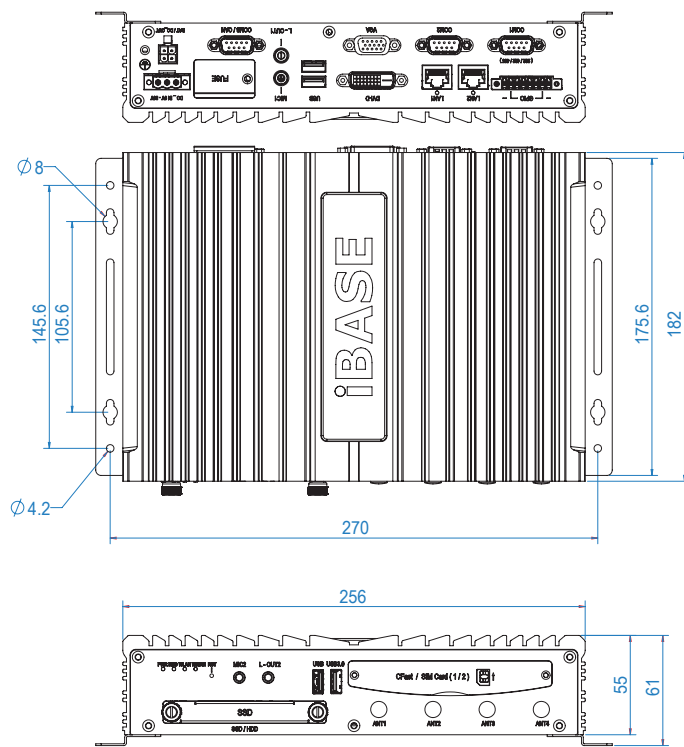
Features

- Fanless and ruggedized design
- Dual SIM sockets support WWAN redundancy
- Removable 2.5" device bay and CFAST socket
- Rich I/O interfaces for wireless, SSD, GPS, WWAN and add-on card expansion
- Fully car battery power control
- Wide-range voltage GPIO interface
- Optional CAN 2.0B/ OBD-II function (SAE J1939)

Ordering Information

| | |
|---------------|---|
| MPT-3000VSM | MPT-3000V with MBT-3001V, Intel® Atom® Processor E3845 w/ 2x 2GB DDR3L-1333, SSD bay, No PSU, No storage (RoHS) |
| LTE-ANT-INT-1 | 20cm 4G/3G WWAN antenna cable from M.2 to SMA Jack |
| LTE-ANT-INT-2 | 20cm 4G/3G WWAN antenna cable from mPCI-E to SMA Jack |

Dimensions





Features

- Fanless and ruggedized design
- Robust M12 connectors for dual GbE
- Dual SIM sockets support WWAN redundancy
- Onboard isolated CAN 2.0A / 2.0B / CAN-FD
- Removable 2.5" device bay for SSD storage
- Rich I/O interfaces for wireless, SSD, GPS, WWAN and add-on card expansion
- Ignition power control
- Wide-range voltage GPIO interface
- 1x USB Type-C with graphics output for quick setting and diagnostics

Specifications

| | |
|--------------------------|--|
| System Mainboard | MBT-3101V |
| CPU Type | Intel® Atom® x6425RE Processor |
| Processor Speed | Up to 1.9GHz |
| Memory | 2x 4GB DDR4-3200 SO-DIMM (Dual Channel) |
| Front Panel External I/O | 2x USB 3.2 Gen2 stack Type-A connector 1x DisplayPort with lockable hole design 2x External accessible SIM socket 2x Removable 2.5" SSD device bay 1x 3.5mm Line-out / MIC-in 1x Reset button 1x 8-pin terminal block digital I/O with 24V input and output 6x SMA antenna holes 4x Light-pipe for status LED indicators |
| Rear Panel External I/O | 2x M12 X-code 8P female for GbE LAN1/LAN2 1x M12 A-code 4P male for DC-input 1x DVI-D connector, 1 x VGA connector 1x USB Type-C connector with DP 1x Terminal block DIP 4 pins for 2 x CAN bus master 1x DB9M for COM#1 / COM#2 1x Removable blade fuse holder 2x Light-pipe for LAN status LED indicators |
| Storage | 1x M.2 2280 M-Key socket for NVMe SSD (PCI-E x4 [Gen.4]) 1x 2.5" removable device bay for SSD |
| Expansion slots | 1x M.2 2230 E-Key socket for WLAN & BT connection (PCI-E + USB2.0 + SMBus). 1x M.2 3042/52 B-Key socket for WWAN (4G/5G) connection (PCI-E + USB3.2 + SMBus). 1x M.2 2280 M-Key socket for NVMe SSD / Hailo AI module (PCI-E x4 [Gen.4]) 1x Mini PCI-E full-size socket for MVB/CAN FD module (PCI-E + USB2.0 + SMBus) |
| Power Supply | DC-input 9V ~ 36V |
| Construction | Aluminum |
| Chassis Color | Black |
| Mounting | Wall mount |
| Dimensions | 256.0 (W) x 182.0 (D) x 83.0 (H) mm 10.08" (W) x 7.17" (D) x 3.27" (H) |
| Operating Temperature | -40°C ~ 70°C (-40°F ~ 158°F) (w/o FAN & SSD) -20°C ~ 55°C (-4°F ~ 131°F) (w/ PCI-E card) |
| Storage Temperature | -40°C ~ 85°C (-40°F ~ 185°F) |
| Relative Humidity | 10 ~ 95% RH @45°C (non-condensing) |

| | |
|-----------|--|
| Vibration | Operating/Non-operating (SSD): 2,26 Grms (5~500 Hz) / MIL-STD-810G composite wheeled condition (Z-axis only) |
| Shock | Operating: Sawtooth: 20G, 11 msec (Z-axis) / MIL-STD-810G Non-operating: Sawtooth: 40G, 11 msec (Z-axis) / MIL-STD-810G |
| Certified | E-Mark-24 CE (EN 62368-1 / EN55032 / EN55035), FCC Class B UKCA (BS EN 62368-1 / BS EN55032 / BS EN55035) |

Ordering Information

| | |
|-----------|---|
| MPT-3100V | MPT-3100V with MBT-3101V, Intel® Atom® x6425RE Processor w/ 2x 4GB DDR4-3200, 1x SSD bay, No PSU, No storage (RoHS) |
|-----------|---|

MPT-7000V

In-Vehicle Computer System

E-mark Certified 7th/6th Gen Intel® Core™ Processor In-Vehicle Computer System with WWAN Redundancy



Features

- Fanless and ruggedized design
- Dual SIM sockets support WWAN redundancy
- Two removable 2.5" device bay and CFAST socket
- Rich I/O interfaces for wireless, SSD, GPS, WWAN and add-on card expansion
- Full car battery power control
- Wide-range voltage GPIO interface
- One PCI-E (x4) expansion

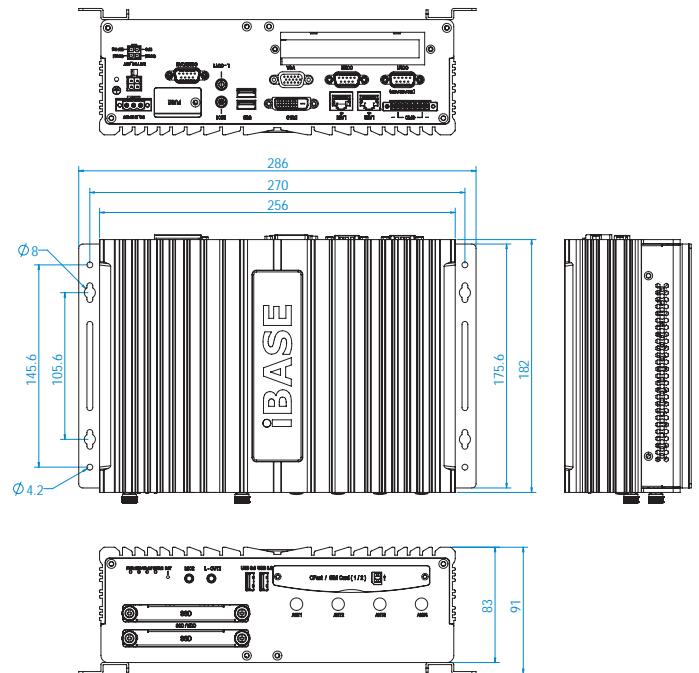
Specifications

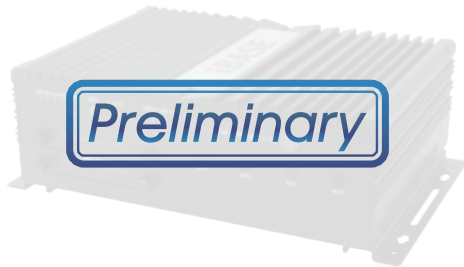
| | |
|--------------------------|--|
| System Mainboard | MPT-7001V |
| CPU Type | 7th/6th Gen Intel® Core Processor |
| Processor Speed | 2.6GHz |
| Memory | 2x 4GB DDR4-2133 SO-DIMM (Dual Channel) |
| Front Panel External I/O | CFAST, 2.5" device bay, 2nd Mic-In & Line-Out 2x SIM sockets, 2x USB 3.0, Reset button Status LEDs, 4x antenna connectors |
| Rear Panel External I/O | DVI-D, VGA, 3x COMs (one with RS422/485 options) 2x GbE, 2x USB 2.0, power connection, 1st Mic-In & Line-Out, GPIO, GbE status LEDs, 1x PCI-E (x4) slot |
| Storage | 2x 2.5" device bay for SSD & HDD |
| Expansion slots | 1x Half-size Mini PCI-E socket (USB 2.0) 1x Full-size Mini PCI-E socket (USB 2.0 + PCI-E) 1x 2230 M.2 E-Key socket (USB 2.0 + PCI-E) 1x 3042 M.2 B-Key WWAN socket (USB 2.0) 1x 2280 M.2 M-Key SSD socket (SATA) |
| Power Supply | DC 9V~36V |
| Construction | Aluminum |
| Chassis Color | Black |
| Mounting | Custom mounting rail |
| Dimensions | 256.0 (W) x 182.0 (D) x 83.0 (H) mm 10.08" (W) x 7.17" (D) x 3.27" (H) |
| Operating Temperature | SSD: -30°C ~ 55°C (-22°F~131°F) HDD: -20°C ~ 45°C (-4°F~113°F) SSD: -40°C ~ 70°C (-40F ~ 158°F) system only |
| Storage Temperature | -35°C ~ 85°C (-31°F~185°F) |
| Relative Humidity | 10 ~ 95% RH @ 45°C (non-condensing) |
| Vibration | Operating/Non-operating (SSD): 2,26 Grms (5~500 Hz) / MIL-STD-810G composite wheeled condition (Z-axis only) Operating/Non-operating (HDD): 1,04 Grms (5~500 Hz) / MIL-STD-810G highway truck condition (Z-axis only) |
| Shock | Non-operating: Sawtooth: 40G, 11 msec (Z-axis) Operating: Sawtooth: 20G, 11msec (Z-axis) |
| Certified | E-mark, CE class B, FCC class B |

Ordering Information

| | |
|----------------|---|
| MPT-7000VSM | MPT-7000V with MBT-7001V, 6th Gen Intel® Core™ i7-6600U Processor w/ 2x 4GB DDR4-2133, 2xSSD bay, No PSU, No storage (RoHS) |
| LTE-ANT-INT-1 | 20cm 4G/3G WWAN antenna cable from M.2 to SMA Jack |
| LTE-ANT-INT-2 | 20cm 4G/3G WWAN antenna cable from mPCI-E to SMA Jack |
| WLAN-ANT-INT-1 | 20cm WLAN antenna cable from M.2 to SMA Jack |

Dimensions





Features

- Fanless and ruggedized design
- Robust M12 connectors for dual GbE
- Dual SIM sockets support WWAN redundancy
- Onboard isolated CAN 2.0A / 2.0B / CAN-FD
- Full car battery ignition power control
- Two removable 2.5" device bay for SSD storage
- Rich I/O interfaces for wireless, SSD, GPS, WWAN and add-on card expansion
- Wide-range voltage GPIO interface
- 1x USB Type-C with graphics output for quick setting and diagnostics

Specifications

| | |
|--------------------------|--|
| System Mainboard | MBT-7100V |
| CPU Type | 13th Gen Intel® Core U-Series Processor |
| Processor Speed | Up to 3.0GHz |
| Memory | 2x 8GB DDR5-4800 SO-DIMM (Dual Channel) |
| Front Panel External I/O | 2x USB3.2 Gen2 stack Type-A connector 2x External accessible SIM socket 1x USB Type-C connector with DP 2x Removable 2.5" SSD device bay 1x 3.5mm green color audio for Line-out 1x 3.5mm pink color audio for MIC-in 1x Reset button 1x 10-pin terminal block for digital I/O 8x SMA antenna holes 6x Light-pipe for status LED indicators (2x programmable) |
| Rear Panel External I/O | 2x M12 X-code 8P female for GbE LAN1/LAN2 2x M12 D-code 4P female for USB 2.0 1x 3-pin terminal block for DC-input 1x DisplayPort with lockable hole design 1x DVI-D connector, 1 x VGA connector 1x 6-pin terminal block for 2 x CAN bus master 2x DB9M for COM#1 / COM#2 1x Removable blade fuse holder 4x Light-pipe for LAN status LED indicators 1x M3 with washer screw hole for grounding connection |
| Storage | 1 x M.2 2280 M-Key socket for NVMe SSD (PCI-E x4 [Gen.4]) 2 x 2.5" removable device bay for SSD |
| Expansion slots | 1x M.2 2230 E-Key socket for WLAN & BT connection (PCI-E + USB2.0 + SMBus). 1x M.2 3042/52 B-Key socket for WWAN (4G/5G) connection (PCI-E + USB3.2 + SMBus). 1x M.2 2280 M-Key socket for NVMe SSD / Hailo AI module (PCI-E x4 [Gen.4]) 1x Mini PCI-E full-size socket for MVB/CAN FD module 1x Mini PCI-E half-size socket (USB 2.0)(PCI-E + USB2.0 + SMBus) |
| Power Supply | DC-input 9V ~ 36V |
| Construction | Aluminum |
| Chassis Color | Black |
| Mounting | Wall mount |
| Dimensions | 256.0 (W) x 182.0 (D) x 83.0 (H) mm 10.08" (W) x 7.17" (D) x 3.27" (H) |
| Operating Temperature | -40°C ~ 70°C (-40°F~158°F) (w/o FAN & SSD) -20°C ~ 55°C (-4°F~131°F) (w/ PCI-E card) |

| | |
|---------------------|---|
| Storage Temperature | -40°C ~ 85°C (-40°F~185°F) |
| Relative Humidity | 10 ~ 95% RH @45°C (non-condensing) |
| Vibration | Operating/Non-operating (SSD): 2.26 Grms (5~500 Hz) / MIL-STD-810G, composite wheeled condition (Z-axis only) |
| Shock | Operating: Sawtooth: 20G, 11msec (Z-axis) / MIL-STD-810G, Non-operating: Sawtooth: 40G, 11 msec (Z-axis) / MIL-STD-810G |
| Certified | E-Mark-24 CE (EN 62368-1 / EN55032 / EN55035), FCC Class B UKCA (BS EN 62368-1 / BS EN55032 / BS EN55035) |

Ordering Information

| | |
|-----------|---|
| MPT-7100V | MPT-7100V with MBT-7101V, 13th Gen Intel® Core™ i7-1365URE Processor w/ 2x 8GB DDR5-4800, 2x SSD bay, No PSU, No storage (RoHS) |
|-----------|---|



Specifications

| | |
|--------------------------------|--|
| CPU Type | MRD286-N42: Intel® Pentium® Processor N4200 (1.1GHz~2.5GHz) MRD286-I50: Intel® Atom™ x7-E3950 Processor (1.6GHz~2.0GHz) |
| Memory | 2x DDR3L SO-DIMM, Max. 8GB, 1x Default 4GB |
| Display Size | 28.6" |
| Max. Resolution | 1920 x 540 |
| Luminance (cd/m ²) | 1,000 |
| Contrast | 1000:1 |
| Max. Color | 16.7M |
| View Angle (H°/V°) | 178/178 |
| Backlight Lifetime(hrs) | 50,000 |
| Touch Type | None, enhanced glass, anti-scattering, IK07 rating |
| Touch Interface | None |
| Light Transmission (%) | 90 |
| Point of touch | None |
| I/O Interface | 1x 8-pin M12 A-code for 2x USB 2.0 1x 8-pin M12 A-code for RS-232/422/485 1x 8-pin M12 X-code GbE LAN 1x 3-pin M12 A-code Power Connector |
| Power Button | IP65 membrane key |
| Power Input Range | 24V DC or 110V DC |
| Membrane Control | Dimming control, power on/off |
| Audio | 2x IP65 2W speaker |
| Internal Expansion | None |
| Wireless | Optional |
| Storage | 1x 2.5" HDD space, default 64GB SSD, easy accessible |
| IP Rating | IP65 for other sides IP43 |
| Thermal Design | Fanless |
| Construction | Metal |
| Chassis Color (Front/Back) | Black/Black |
| Mounting | Side mount, VESA 100x100 |
| Dimensions | 780 (W) x 278 (D) x 77 (H) mm 30.7"(W) x 10.9"(D) x 3.03"(H) |
| Net Weight | 15 kgs |
| Operating Temperature | -25°C ~ 55°C (-13°F ~ 131°F) |
| Storage Temperature | -25°C~70°C (-13°F ~ 158°F) |
| Storage Humidity | 0~90% @40°C |
| Certified | CE/FCC Class-A +LVD EN50155, EN45545-2 Compliance |
| Operating Systems | Windows 10, Linux Kernel 4.X |

Features

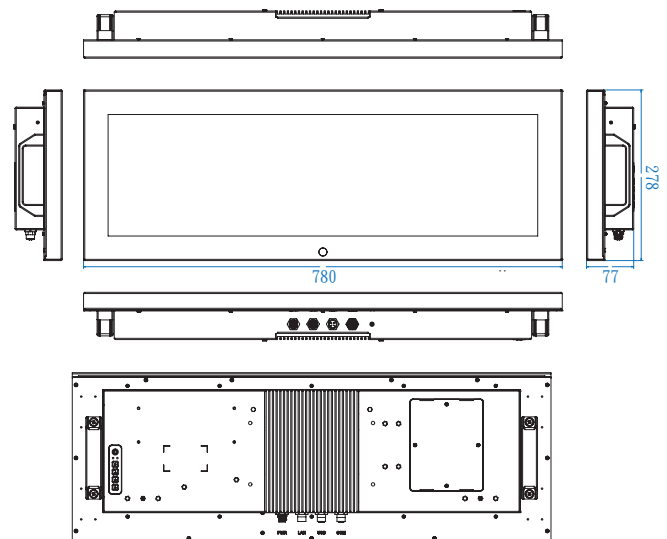
- Intel® Atom® x7-E3950 / Pentium® N4200 Processor
- Sunlight readable 1000nits bar type panel
- Auto-dimming function
- IP65 front-panel waterproof protection
- Anti-scattering front side glass



Ordering Information

| | |
|-------------|--|
| MRD286-N42 | 28.6" 1920 x 540 Bar Type-AIO, Intel® Pentium® Processor N4200, 4GB memory,64GB SSD, 24VDC power input, without adaptor |
| MRD286-N42H | 28.6" 1920 x 540 Bar Type-AIO, Intel® Pentium® Processor N4200, 4GB memory,64GB SSD, 110VDC power input, without adaptor |
| MRD286-I50 | 28.6" 1920 x 540 Bar Type-AIO, Intel® Atom® x7-E3950 Processor, 4GB memory,64GB SSD, 24VDC power input, without adaptor |
| MRD286-I50H | 28.6" 1920 x 540 Bar Type-AIO, Intel® Atom® x7-E3950 Processor, 4GB memory,64GB SSD, 110VDC power input, without adaptor |

Dimensions





Features

- Intel® Atom® x7-E3950 Processor
- EN50155 (2017) & EN45545-2 certified
- Fully IP65 waterproof protection
- Supports ultra-long-life LCD panel, M12 connectors
- Flat bezel design, projected capacitive 15" touch screen
- Optional wireless communication
- Supports 24V DC or 72/110V DC power input



Specifications

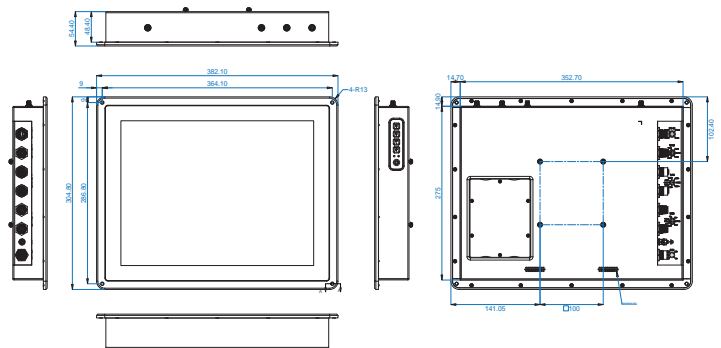
| | |
|--------------------------------|--|
| CPU Type | Intel® Atom® x7-E3950 Processor 1.6GHz, up to 2.0GHz |
| Memory | Max DDR3L 8GB, Default 4GB |
| Display Size | 15" |
| Max. Resolution | 1024x768 |
| Luminance (cd/m ²) | 500 |
| Contrast | 1800:1 |
| Max. Color | 16.7M |
| View Angle (H°/V°) | 178/178 |
| Backlight Lifetime(hrs) | 70,000 |
| Touch Type | Projected capacitive |
| Touch Interface | USB |
| Light Transmission (%) | 89 |
| Point of touch | 10 |
| I/O Interface | 2x M12 A-code 8P GbE 3x M12 D-code 4P USB 2.0 1x M12 A-code 8P for RS-232/422/485 1x M12 A-code 4P DC-input |
| Power Button | Membrane key |
| Power Input Range | DC24V or DC 72V/110V |
| Membrane Control | Brightness up/down, volume up/down, power on/off |
| Audio | 2x speakers |
| Internal Expansion | 1x miniPCI-E (Full size) 1x miniPCI-E (Half size) |
| Wireless | Optional, Via miniPCI-E device |
| Storage | 1x 2.5" HDD space, default 128G SSD |
| Thermal Design | Fanless |
| Construction | Aluminums |
| Chassis Color (Front/Back) | Black/Black |
| IP Rating | IP65 |
| Mounting | VESA 100x100/Rack mount |
| Dimensions | 382.1mm (W) x 304.8mm (D) x 54.4mm (H) 15.04"(W) x 12"(D) x 2.14"(H) |
| Net Weight | 6.36 kg |
| Operating Temperature | -30°C ~70°C (-22°F ~ 158°F) with SSD, not including add-on cards |
| Storage Temperature | -40°C ~ 85°C (-40°F ~ 185°F) |
| Storage Humidity | 10%~90% @40°C (non-condensing) |
| Certified | EN50155:2017, EN45545-2 CE/FCC class-A |

| | |
|-------------------|------------------------------------|
| Operating Systems | Windows 10 64bit/ Linux Kernel 4.X |
|-------------------|------------------------------------|

Ordering Information

| | |
|-------------|---|
| MPPC1501PC | 15" EN50155 Certified Panel PC, Intel® Atom® x7-E3950 Processor, 4GB DDR3L memory, 128G SSD Storage, M12 connectors, DC 24V power input, no adaptor |
| MPPC1501PCH | 15" EN50155 Certified Panel PC, Intel® Atom® x7-E3950 Processor, 4GB DDR3L memory, 128G SSD Storage, M12 connectors, DC 72/110V power input, no adaptor |

Dimensions





Features

- Intel® Atom® x6425E processor
- EN50155 (2017) & EN45545-2 certified
- Fully IP65 waterproof protection
- Supports ultra-long-life LCD panel, M12 connectors
- Flat bezel design, projected capacitive 12.1" touch screen
- Optional Auto dimming adjustable
- Supports 24V DC or 72/110V DC power input



Specifications

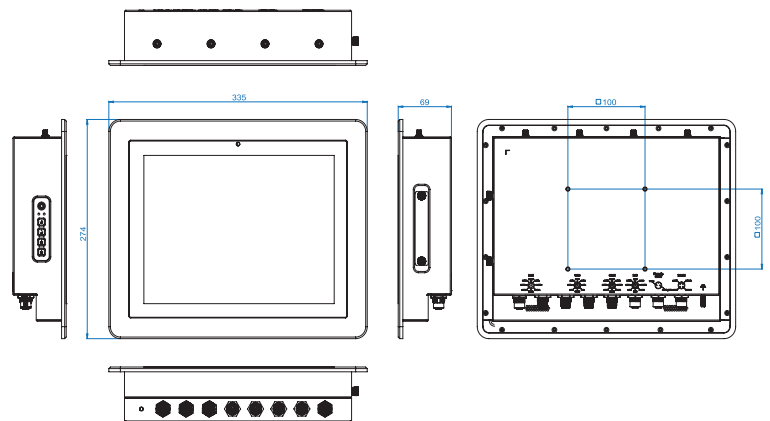
| | |
|----------------------------|---|
| CPU Type | Intel® Atom® QC x6425E Processor, 2.0GHz , up to 3.0GHz |
| Memory | 2x DDR4-3200 4GB, Max 32GB |
| Display Size | 12.1" TFT-LCD |
| Max. Resolution | 1024x768 |
| Luminance (cd/m2) | 500 |
| Contrast | 1000:1 |
| Max. Color | 16.2M |
| View Angle (H°/V°) | 176/176 |
| Backlight Lifetime(hrs) | 30,000 |
| Touch Type | Projected capacitive |
| Touch Interface | USB |
| Light Transmission (%) | 86 |
| Point of touch | 10 |
| I/O Interface | 2x M12 X-code 8P GbE 2x M12 D-code 4P USB 2.0 1x M12 A-code 8P RS232/422/485 1x M12 A-code 8P DIO (4in/2out) 1x M12 A-code 4P DC-input 1x M12 A-code 2P remote control 1x M4 size earth grounding |
| Power Button | Membrane key |
| Power Input Range | DC24V or DC 72V/110V |
| Membrane Control | Brightness up/down, volume up/down, power on/off |
| Audio | 2x speakers for optional |
| Internal Expansion | 1x Full sized Mini-PCI-E slot (USB2.0 + SATA +PCI-E(x1)) 1x M.2 E-Key 2230 socket (USB 2.0) |
| Wireless | Optional 4G and WiFi modules |
| Storage | 1x 2.5" device bay for SSD |
| Thermal Design | Fanless |
| Construction | Aluminum |
| Chassis Color (Front/Back) | Black/Black |
| IP Rating | IP65 |
| Mounting | VESA 100x100 Panel mount (IP65 front panel only) |
| Dimensions | 335mm (W) x274mm (D) x69mm (H) 13.19"(W) x 10.79"(D) x 2.7"(H) |
| Net Weight | 3.1 kg |
| Operating Temperature | -40°C ~70°C, with industrial-grade SSD, not included add-on cards |

| | |
|---------------------|---|
| Storage Temperature | -40°C~85°C (-40°F~185°F) |
| Storage Humidity | 5%~90% @40°C (non-condensing) |
| Certified | EN50155:2017 EN45545-2 CE/FCC class-A |
| Operating Systems | Windows 10 64bit Linux Kernel 4.X |

Ordering Information

| | |
|-------------|---|
| MPPC1201PC | 12.1" EN50155 Certified Panel PC, Intel® Atom™ Processor x6425E, 4GB DDR4 memory, industrial-grade 64GB SSD, M12 connectors, DC 24V power input, no adaptor |
| MPPC1201PCH | 12.1" EN50155 Certified Panel PC, Intel® Atom™ Processor x6425E, 4GB DDR4 memory, industrial-grade 64GB SSD, M12 connectors, DC 72/110V power input, no adaptor |

Dimensions





Features

- Intel® Atom® x7-E3950 Processor
- EN50155 (2017) & EN45545-2 certified
- Fully IP65 waterproof protection
- Supports ultra-long-life LCD panel, M12 connectors
- Flat bezel design, projected capacitive 10.4" touch screen
- Optional wireless communication
- Supports 24V DC or 72/110V DC power input
- Optional Auto dimming adjustable



Specifications

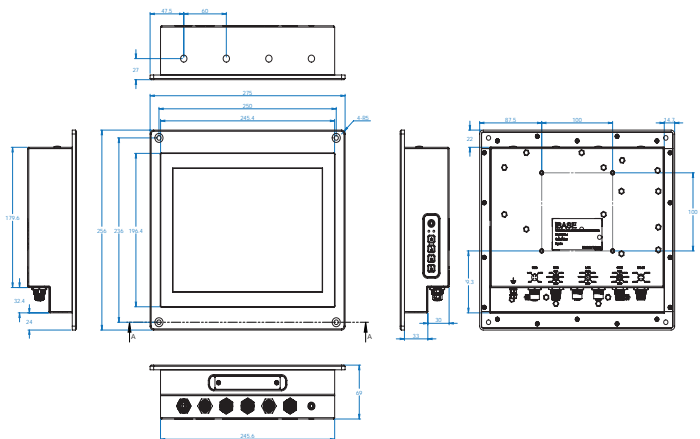
| | |
|--------------------------------|--|
| CPU Type | Intel® Atom® x7-E3950 Processor 1.6GHz, up to 2.0GHz |
| Memory | Max DDR3L 8GB, Default 4GB |
| Display Size | 10.4" |
| Max. Resolution | 1024x768 |
| Luminance (cd/m ²) | 500 |
| Contrast | 1000:1 |
| Max. Color | 16.2M |
| View Angle (H°/V°) | 176/176 |
| Backlight Lifetime(hrs) | 50,000 |
| Touch Type | Projected capacitive |
| Touch Interface | USB |
| Light Transmission (%) | 89 |
| Point of touch | 10 |
| I/O Interface | 2x M12 A-code 8P GbE 2x M12 D-code 4P USB 2.0 1x M12 A-code 8P for RS-232/422/485 1x M12 A-code 4P DC-input |
| Power Button | Membrane key |
| Power Input Range | DC24V or DC 72V/ 110V |
| Membrane Control | Brightness up/down, volume up/down, power on/off |
| Audio | 2x speakers |
| Internal Expansion | 1x miniPCI-E (Full size) 1x miniPCI-E (Half size) |
| Wireless | Optional, Via miniPCI-E device |
| Storage | 1x 2.5" HDD space, default 64GB SSD |
| Thermal Design | Fanless |
| Construction | Aluminums |
| Chassis Color (Front/Back) | Black/Black |
| IP Rating | IP65 |
| Mounting | VESA 100x100/Rack mount |
| Dimensions | 275mm(W) x 256mm(D) x 63mm(H) 10.8"(W) x 6.14"(D) x 2.48"(H) |
| Net Weight | 4.3 kgs |
| Operating Temperature | -30°C ~ 70°C (-22°F ~ 158°F) with SSD, not including add-on cards |
| Storage Temperature | -40°C ~ 85°C (-40°F ~ 185°F) |
| Storage Humidity | 10%~90% @40°C (non-condensing) |
| Certified | EN50155:2017, EN45545-2 CE/FCC class-A |

| | |
|-------------------|------------------------------------|
| Operating Systems | Windows 10 64bit/ Linux Kernel 4.X |
|-------------------|------------------------------------|

Ordering Information

| | |
|-------------|--|
| MPPC1001PC | 10.4" EN50155 Certified Panel PC, Intel® Atom® x7-E3950 Processor, 4GB DDR3L memory, 64G SSD Storage, M12 connectors, DC 24V power input, no adaptor |
| MPPC1001PCH | 10.4" EN50155 Certified Panel PC, Intel® Atom® x7-E3950 Processor, 4GB DDR3L memory, 64G SSD Storage, M12 connectors, DC 72/110V power input, no adaptor |

Dimensions





Specifications

| | |
|--------------------------------|--|
| CPU Type | Intel® Atom® Processor E3845 (Quad-Core 1.91GHz) |
| Memory | 2x DDR3L SO-DIMM, up to 8GB, default DDR3L 4GB (4GBx1) |
| Display Size | 12.1" TFT-LCD |
| Max. Resolution | 1024 x 768 |
| Luminance (cd/m ²) | 500 |
| Contrast | 1000:1 |
| Max. Color | 16.7M |
| View Angle (H°/V°) | 178/178 |
| Backlight Lifetime(hrs) | 30000 |
| Touch Type | Projected capacitive |
| Touch Interface | USB |
| Light Transmission (%) | 86 |
| Point of touch | 10 |
| I/O Interface | 1x USB 3.0 2x USB 2.0 (1x Type A and 1x M12 A-code 4P connector) 1x COM port for RS-232/422/485 2x GbE LAN ports, 2x 10/100 LAN with M12 connector 1x Display port 1x M12 A-code 4P DC-input |
| Power Button | Reset button |
| Power Input Range | 24V DC (default) power input, Optional 72V DC & 110V DC |
| Membrane Control | Brightness up/down and Volume up/down/power button |
| Audio | 2x Speakers |
| Internal Expansion | 1x mPCI-E(x1) w/ USB signal [half-size] 1x mSATA/mPCI-E(x1) w/ USB signal and mSATA supports [full-size] |
| Wireless | Optional Wi-Fi/BT |
| Storage | 1x 2.5" SATA |
| Thermal Design | Fanless |
| Construction | Aluminum front bezel and back cover |
| Chassis Color (Front/Back) | Silver/Silver |
| IP Rating | IP65 front bezel/ IP54 for whole unit with I/O cover |
| Mounting | Wall mount and VESA 75x75 mm |

Features

- EN50155 certified
- Optical bonding
- Front bezel IP65 and full IP54 protection
- Movable and programmable membrane keypad
- 24V DC power input with M12 connector, 48V DC, 72V DC or 110V DC as options
- Two M12 LAN ports and one M12 USB port
- Additional rack mount kit

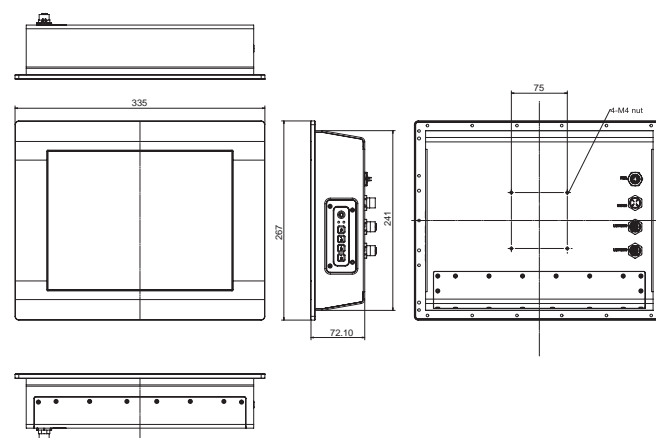


| | |
|-----------------------|---|
| Dimensions | 335 (W) x 267 (D) x 72.1 (H) mm 13.18" (W) x 10.5" (D) x 2.83" (H) |
| Net Weight | 3.6 kgs |
| Operating Temperature | -30°C~70°C (-22 ~158 °F) (EN50155-TX) |
| Storage Temperature | -40°C ~ 85°C (-40 ~185 °F) |
| Storage Humidity | 10%~90% (non-condensing) |
| Certified | EN50155: 2017, EN45545-2 CE/FCC Class-B |
| Operating Systems | Windows 10 32/64-bit, Windows 7 32/64-bit, Linux 3.x/4.x |

Ordering Information

| | |
|--------------------------|---|
| BYTEM-123-PC | 12.1" (1024 x 768) Panel PC with IB897, Intel® Atom® Processor E3845 1.91GHz, 4GB DDR3L SO-DIMM, 64G SSD, projected capacitive touch, w/o power adaptor |
| Power adaptor (optional) | AC 100V~240V input, 24V DC output 90W power adaptor, IBASE P/N: A005PS090W0100600P |

Dimensions





Features

- EN50155 certified
- Front bezel IP65 and full IP54 protection
- Full flat bezel design
- One M12 LAN port
- 24V DC power input with M12 connector, 48V DC, 72V DC or 110V DC as options
- Programmable membrane keypad
- Additional rack mount kit



Specifications

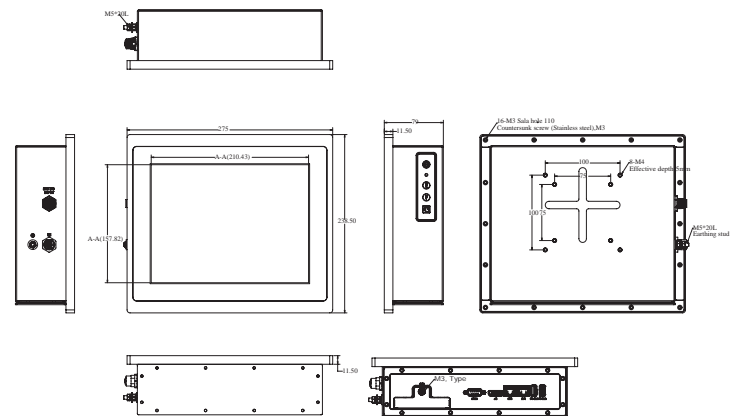
| | |
|--------------------------------|---|
| CPU Type | Intel® Atom® Processor E3845 (Quad-Core @ 1.91GHz) |
| Memory | 2x DDR3L SO-DIMM, up to 8GB, default DDR3L 4GB (4GBx1) |
| Display Size | 10.4" TFT-LCD |
| Max. Resolution | 1024 x 768 |
| Luminance (cd/m ²) | 500 |
| Contrast | 1000:1 |
| Max. Color | 16.2M |
| View Angle (H°/V°) | 176/176 |
| Backlight Lifetime(hrs) | 50000 |
| Touch Type | Projected capacitive |
| Touch Interface | USB |
| Light Transmission (%) | 85 |
| Point of touch | 2 |
| I/O Interface | 1x USB 3.0 1x USB 2.0 2x GbE LAN ports 1 x Display port 1x COM port for RS-232/422/485 1x M12 A-code 4P DC-input 1x 10/100 LAN with M12 connector |
| Power Button | Membrane key |
| Power Input Range | Default 24V DC input (EN50155 S2/C2), Optional 72V DC & 110V DC |
| Membrane Control | Brightness up/down and screen on/off/, power button |
| Audio | None |
| Internal Expansion | 1x mPCI-E(x1) w/ USB signal [half-size] 1x mSATA/mPCI-E(x1) w/ USB signal and mSATA supports [full-size] |
| Wireless | None |
| Storage | 1x 2.5" SATA |
| Thermal Design | Fanless |
| Construction | Aluminum front bezel and back cover |
| Chassis Color (Front/Back) | Silver/Silver |
| IP Rating | IP65 front bezel/ Others IP40 not including I/O cover/ IP54 for all with I/O cover |
| Mounting | Wall mount and VESA 75x75, 100x100 mm |
| Dimensions | 275 (W) x 238.5 (D) x 78.5 (H) mm 10.82" (W) x 9.38" (D) x 3.09" (H) |
| Net Weight | 4.3 kg |

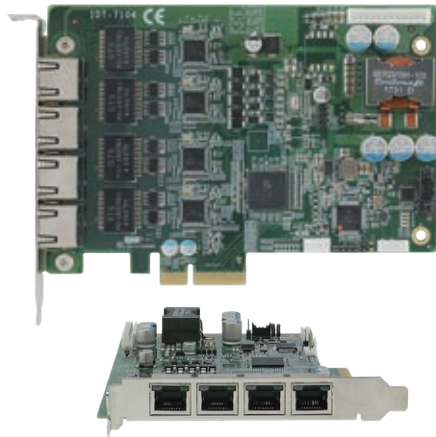
| | |
|-----------------------|--|
| Operating Temperature | -30°C~70°C (-22 ~158 °F) (EN50155-TX) |
| Storage Temperature | -40°C ~ 85°C (-40 ~185 °F) |
| Storage Humidity | 10%~90% (non-condensing) |
| Certified | EN50155, EN45545-2 CE/FCC Class-B |
| Operating Systems | Windows 10 32/64-bit, Windows 7 32/64-bit, Linux 3.x/4.x |

Ordering Information

| | |
|--------------------------|---|
| BYTEM-103-PC | 10.4" (1024 x 768) Flat Panel Design Panel PC with IB897, Intel® Atom® Processor E3845 1.91GHz, 4GB DDR3L SO-DIMM, 64G SSD, projected capacitive touch, w/o power adaptor |
| Power adaptor (optional) | AC 100V~240V input, 24V DC output 90W power adaptor, IBASE P/N: A005PS090W0100600P |

Dimensions





Features

- 4x PCI Express® compliant
- 4x independent Gigabit Ethernet ports supported
- IEEE 802.3af/at for Power over Ethernet supported
- IEEE 1588, PTP technology supported
- Link aggregation/jumbo frames (9 K-Byte) supported
- Operating temperature: -40°C ~ 70°C (-40°F ~ 158°F)

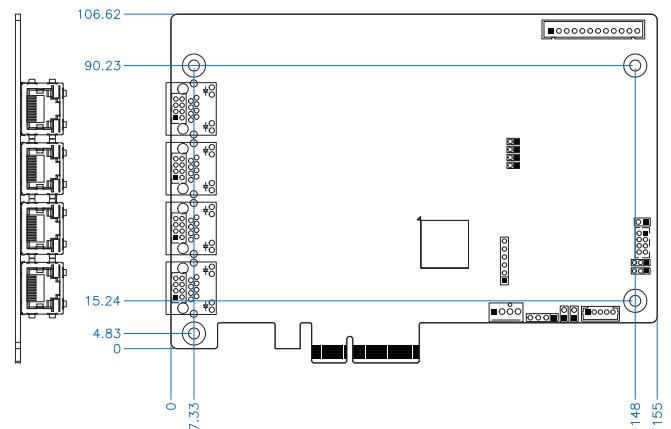
Specifications

| | |
|-----------------------|--|
| Form Factor | 4x PCI Express® compliant |
| Power Input | Maximal 10A @12VDC, directly from onboard power connector |
| LAN Chipset | Four Intel® i210IT Ethernet controllers |
| Cable Requirement | CAT-5e or CAT-6 cable, maximum 100 meters |
| Hipot | 1.5 KV |
| Surge | ±2KV surge protection |
| PoE Power Output | 802.3af/at compliant (802.3AT type 1,2) Powered Device (PD) auto detection Power Level Classification: Class 1, 2, 3, 4 25.5W@48VDC power output (per powered-device) |
| Conformity | CE, FCC Class-A, RoHS |
| Operating Temperature | -40°C ~ 70°C (-40°F ~ 158°F) |
| Storage Temperature | -35°C ~ 85°C (-31°F ~ 185°F) |
| Operating Humidity | 10%~95% @ 45°C (non-condensing) |
| Dimensions | 155 x 111 mm (6.10" x 4.37") |
| Power Consumption | Max. 120W w/ 4x PoE power load |
| Construction | Aluminum |
| Operating System | XPe / W7 Pro/ WE8 STD / Ubuntu 11.10 above / Linux distributions with kernel 3.0 above |

Ordering Information

| | |
|----------|-------------------------------------|
| IDT-7104 | 4-channel PoE card with power cable |
|----------|-------------------------------------|

Dimensions



HEADQUARTERS

IBASE Technology Inc.
Bldg. F, 15F-1, No. 3, Yuan Qu Street,
Nangang, Taipei 11503, Taiwan, R.O.C.

廣積科技股份有限公司
台北市115南港區園區街3號15-1樓F棟
Tel: +886-2-2655-7588
Fax: +886-2-2655-7388
sales@ibase.com.tw
www.ibase.com.tw



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FORTEC
GROUP

FORTEC Elektronik AG
Augsburger Str. 2b
82110 Germering

Phone: +49 89 894450-0
E-Mail: info@fortecag.de
Internet: www.fortecag.de

Fortec Group Members

Austria



FORTEC
INTEGRATED

FORTEC Integrated GmbH Office Vienna
Nuschinggasse 12
1230 Wien

Phone: +43 1 8673492-0
E-Mail: info@fortec-integrated.de
Internet: www.fortec-integrated.de

Germany



FORTEC
INTEGRATED

FORTEC Integrated GmbH
Augsburger Str. 2b
82110 Germering

Phone: +49 89 894363-0
E-Mail: info@fortec-integrated.de
Internet: www.fortec-integrated.de

Switzerland



FORTEC
SWITZERLAND

FORTEC Switzerland AG
Bahnhofstraße 3
5436 Würenlos

Phone: +41 44 7446111
E-Mail: info@fortec.ch
Internet: www.fortec.ch

United Kingdom



FORTEC
UNITED KINGDOM

FORTEC Technology UK Ltd.
Osprey House, 1 Osprey Court
Hinchbrooke Business Park
Huntingdon, Cambridgeshire, PE29 6FN

Phone: +44 1480 411600
E-Mail: info@fortecuk
Internet: www.fortecuk

USA



 **APOLLO DISPLAY**
TECHNOLOGIES
A FORTEC GROUP MEMBER

Apollo Display Technologies, Corp.
87 Raynor Avenue, Unit 1
Ronkonkoma, NY 11779

Phone: +1 631 5804360
E-Mail: info@apollodisplays.com
Internet: www.apollodisplays.com